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STAFF REPORT ON THE  
CONTRA COSTA COUNTY  
TRAUMA SYSTEM

Prepared by  
Contra Costa County Health Services Department  
Emergency Medical Services

June 9, 1987

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STAFF REPORT ON THE  
CONTRA COSTA COUNTY TRAUMA SYSTEM

On June 30, 1986, Contra Costa's trauma system began County-wide operation. This was the culmination of some eighteen months planning and preparation which included

- development of a trauma system plan,
- training and orientation of prehospital and hospital personnel,
- trauma center proposal and site review, and
- designation of John Muir Memorial Hospital as the County's trauma center.

This report summarizes the accomplishments of the County trauma system during this first year and includes the findings and recommendations of an independent evaluation of the trauma system conducted during its first year of operation.

The report is divided into the following three sections:

- Trauma System Audit and Evaluation,
- Bay Area Trauma Registry, and
- Statistics.

Attachments include the "Trauma Triage Criteria" field form (Attachment "A") and the "Contra Costa County Trauma Review" completed by Gail Cooper (Attachment "B").

THE STATE OF THE  
UNION

At the close of the year 1892, the country was in a state of comparative  
prosperity. The agricultural season had been unusually early and the  
crops were well advanced.

The general feeling of the people was one of confidence and  
optimism. The business of the country was brisk and the  
markets were well supplied. The government was in a state of  
peace and the people were content with the administration.

The year 1892 was a year of general prosperity. The  
country was in a state of comparative peace and the  
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## I. SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS

The following sections summarize the major findings and recommendations resulting from reviews of John Muir's trauma center conducted by an independent review team in January and May 1987 and from a review of the County trauma system conducted in May 1987 by an independent consultant and member of the trauma center review team.

### Findings

1. The Contra Costa County trauma system is effective in identifying major trauma victims (MTV's) and ensuring their prompt transport to the trauma center.
2. The Contra Costa County trauma system has established a mechanism of quality assurance that enables the EMS Agency to identify deviations in the standard of care and, if necessary, to take corrective action.
3. The Contra Costa County trauma system appears to have made a significant reduction in preventable trauma deaths during its first eight months of operation.
4. Non-trauma center receiving hospitals do not generally transfer MTV's received at their facilities to the trauma center. This problem may be compounded by personnel from the State Health Department Bureau of Licensing and Certification not permitting transfer of MTV's from Basic Emergency Facilities to the trauma center. The standard of care for MTV's in Contra Costa County has now been established as that given by a designated trauma center and access to that level of care should not be denied.
5. The EMS Agency has not established a system for the collection and analysis of prehospital patient care data for MTV's. It is essential in evaluation of trauma care and the trauma system to be able to assess what impact, if any, EMT's and paramedics have on patient outcome.
6. There is only one radio channel available for paramedics in Contra Costa County to receive base hospital direction. Although priority is given to trauma calls, the communication system remains substandard. Plans for paramedics to use cellular telephones within the next year should improve the prehospital communications network.
7. Since implementation of the trauma system, John Muir's board of directors, administration, and medical staff have maintained their commitment to the trauma center and to the care of the traumatically injured patient.
8. The level of patient care provided by John Muir's trauma center appears



to be excellent overall and is consistent with the standard of care expected of a Level II trauma center. This finding notwithstanding, there are some areas, particularly in the care of patients in the intensive care unit, in which improvements in patient management and physician training must be made in order to maintain the standard of care expected of a Level II trauma center.

9. John Muir has demonstrated a strong commitment to in-hospital trauma care education, but has not yet become involved in prehospital care trauma education.

#### Recommendations of the Trauma Center and Site Review

1. Major trauma victims in Contra Costa County should when possible be treated at a designated trauma center. The County Health Services Department should encourage appropriate transfer of patients to the trauma center and should take steps to see that barriers to such transfers do not exist.
2. A prehospital patient data system should be established to facilitate monitoring by the EMS Agency of the care provided trauma patients in the field.
3. John Muir Memorial Hospital should undertake implementation of the recommendations of the Trauma Center Review Team with respect to intensive care, documentation of hospital quality assurance reviews, and involvement in trauma education of prehospital care personnel.
4. The County EMS Agency should re-evaluate after six months the level of care provided MTV's in the intensive care unit at the trauma center.



## II. TRAUMA SYSTEM OVERVIEW

Contra Costa County's trauma system began County-wide operation on June 30, 1986, following designation of John Muir Memorial Hospital as the County's sole trauma center. The trauma system operates under the provisions of the Contra Costa County Trauma System Plan approved by the Board of Supervisors and by the State Emergency Medical Services Authority. The County Emergency Medical Services Agency has overall responsibility for managing and reviewing the trauma system.


In January 1987, Alameda County initiated its trauma system with the designation of Highland and Eden Hospitals as adult trauma centers and Children's Hospital as a pediatric trauma center. Contra Costa County has subsequently established protocols to transport pediatric trauma directly to Children's Hospital and has arranged for adult trauma patients to be transported to Highland or Eden under certain circumstances when John Muir's trauma center is unable to handle additional patients.

This section discusses operation of the trauma system and presents statistical data on the trauma system's first eight months of operation.

### Trauma Triage and Transport

Under the trauma transport protocols that were put into effect, all trauma patients are assessed by paramedics or EMT-I's in the field and classified as Major Trauma Victims (MTV's) or as non-Major Trauma Victims (non-MTV's). MTV's include:

- (1) all trauma patients scoring a 7 or below on the 10-point CRAMS scale used in the field to assess physiologic functioning and
- (2) trauma patients scoring above 7 but who have one of several listed anatomic factors or mechanisms of injury and who are judged by field and base hospital personnel to be MTV's. Ambulance personnel are



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required to make base hospital contact on all these patients. (See attached "Trauma Triage Criteria" field form.)

Non-MTV's are all those trauma patients for whom protocols require base contact for destination and who are judged not to require the services of a trauma center.

MTV's are normally transported by ground ambulance or helicopter to a designated trauma center. Exceptions are cases which involve:

- (1) cardiac arrest or unmanageable airway;
- (2) excessive transport time considering patient's condition and the goal of getting the patient to surgery within one hour of the occurrence of the incident; and
- (3) periods of trauma center bypass when MTV's are directed to the nearest Basic Emergency Facility. (Trauma center bypass is permitted when a trauma center is unable to handle additional trauma patients.)

Statistics on the trauma system's operation during its first eight months (July 1986 - February 1987) are presented in Tables 1 - 7. During this period, there were 1,536 "trauma base contacts". These include all patients transported by the Emergency Medical Service (EMS) system triaged as MTV's as well as patients for whom base hospital contact was required to determine MTV status. Of these "trauma base contacts":

- 701 (45.6 percent), or an average of 88 patients per month, were triaged as MTV's while the remaining 835 (54.4 percent) were triaged as non-MTV's (Table 1).
- 647 (42.1 percent), or an average of 81 patients per month, were transported to the trauma center. At this rate, the trauma system will result in the transport of some 972 MTV's to the trauma center during the first year of operation.
- 54 (3.5 percent), or an average of 7 patients per month, were triaged as MTV's but transported to the nearest Basic Emergency Facility.

Of the MTV's triaged to non-trauma center facilities, all 54 were either CPR cases or had unmanageable airways (Table 6). Most (44 patients) were pronounced dead in the emergency department, although 5 patients survived to



be discharged or transferred to another facility. During the first eight months of the trauma system, no MTV's were transported to a non-trauma center facility as a result of the trauma center being on bypass.

#### MTV's Treated At John Muir Trauma Center

From July 1986 through February 1987, 599 MTV's were treated and discharged from John Muir (Table 5). More than four out of five (82.8 percent) were blunt trauma. While most patients were transported to the trauma center by ground ambulance, nearly one in ten (9.5 percent) were transported by helicopter. Nearly half (45.9 percent) of the patients were from Central County, about one out of four (25.7 percent) from East County, and slightly fewer than one out of four (22.9 percent) from West County.

Most (91.8 percent) of the MTV's transported to John Muir were admitted to the hospital. Over two out of five MTV's transported to John Muir were admitted to surgery (30.9 percent) or directly to the intensive care unit (13.0 percent). Of the 550 admitted MTV's, 24 (4.4 percent) died.

#### Injury Severity and Triage Accuracy

The classification of trauma patients as MTV's or non-MTV's is based upon field triage. In order to judge the accuracy of field triage, all MTV's and all non-MTV's who are admitted to a hospital are scored according to the Injury Severity Scale (ISS). A patient is considered "severely injured" if (1) his ISS score is over 15, (2) his ISS score is between 10 and 14 and he had a length of stay in the hospital of three or more days, or (3) regardless of his ISS score, injuries resulted in death. Of the 1,536 trauma base contacts, 435 (28.3 percent) were classified as severely injured (Table 3).

In a perfect triage system, all severely injured patients would be triaged as MTV's and all trauma patients without severe injuries would be



triaged as non-MTV's. "Undertriage" refers to the inappropriate classification of severely injured patients as non-MTV's. "Overtriage" refers to the inappropriate classification of non-severely injured patients as MTV's. Since overtriage increases as undertriage is reduced, the practical goal of a field triage system is to minimize undertriage while keeping overtriage within acceptable limits.

Based upon experience in other trauma systems, a goal was set for Contra Costa County's trauma system to achieve, by the end of the first year, an undertriage rate of 5.0 percent or lower while holding overtriage to 50.0 percent or lower. The actual rates of undertriage and overtriage for the first eight months (Table 4) were:

Undertriage	4.9
Overtriage	43.2

#### Patient Outcome

The goal of the trauma system is to reduce mortality and morbidity resulting from trauma. During the trauma system's first eight months, there were 80 deaths (10 per month) among trauma patients transported to the hospital (Table 3). Of these:

- 44 died in the emergency departments of non-trauma center hospitals where they had been transported with CPR in progress or with an unmanageable airway;
- 5 died following admission to a non-trauma center hospital where they had been transported with CPR in progress or with an unmanageable airway;
- 4 died in the emergency department of the trauma center; and
- 27 died following admission to the trauma center.

While a lack of benchmark data from the period prior to trauma system implementation prevents a direct evaluation of the impact of the trauma system in preventing deaths, some comparisons with available data may be made. Using



methodology developed by Howard Champion, M.D., for the national Major Trauma Outcome Study (MTOS), the probabilities of survival can be calculated for adult patients based upon injury severity, age, and type of trauma (blunt or penetrating). Probability of survival data shows survival rates for Contra Costa trauma patients to be at or above what would be expected for trauma centers participating in the MTOS.

Patients for whom probability of survival was calculated, Sept. '86 - Jan. '87 (includes all deaths)	280
Number of expected survivors	262
Number of actual survivors	265

While the above figures show how Contra Costa County's trauma system is doing in comparison with other trauma systems, they do not provide an indication of the impact of the trauma system on reducing mortality from the levels which existed prior to implementation of the trauma system. In a study of trauma deaths in the Bay Area conducted by Donald Trunkey, M.D., in 1981, figures for Contra Costa County showed that 5 (12.8 percent) out of 39 deaths of vehicle accident victims who survived at least 10 minutes following arrival at a hospital were considered "preventable." An additional 12 (30.8 percent) were considered "probably preventable" or "possibly preventable." Altogether, if Trunkey's ratings are to be considered accurate, Contra Costa County was in 1981 experiencing a "possibly preventable death" rate of 43.6 percent of trauma patients taken to the hospital.

By contrast, only 2 (2.5 percent) out of 80 trauma deaths reviewed by the Contra Costa's Trauma Audit Committee (TAC) for the first eight months of the trauma system were rated as "preventable." Four (5.0 percent) were rated as "potentially preventable."



	Trunkey Study 1981	Trauma Audit Committee 1986-87
"Preventable death" rate	12.8	2.5
"Preventable or possibly preventable death" rate	43.6	7.5
(N=)	(39)	(80)

A 43.6 percent "preventable or possibly preventable death" rate such as Trunkey reported would have meant an additional 51 trauma deaths in Contra Costa County during the first eight months of the trauma system.

#### Trauma Center Bypass

Trauma center bypass refers to policies which permit trauma centers to go on bypass; that is, close to trauma patients under conditions when the specialized services of a trauma center are unavailable. Trauma centers are required to establish policies on bypass. John Muir's trauma bypass policy enables the trauma surgeon and/or emergency department physician to authorize bypass or limited bypass when:

- (1) the ICU has no available beds and the status of the current ICU patients precludes transfer out of the ICU;
- (2) the two CT scanners are both non-operational,
- (3) the resources in the trauma resuscitation room are being utilized to an extent that precludes the admission of additional major trauma victims, or
- (4) operating rooms are overloaded due to critically injured patients.

Critical trauma and nontrauma patients may still be transported to the trauma center's emergency department under protocols specifying transport to the nearest Basic Emergency Facility.

At the time the County's trauma system was initiated, John Muir was the



only trauma center available for Contra Costa patients. The transport protocol developed for bypass therefore provided for transport of MTV's to the nearest Basic Emergency Facility.

During the first eight months of the trauma system's operation, there were few periods that the trauma center was on bypass and no MTV's actually had to be transported to a nontrauma center as a result of bypass (Table 6). More recently, however, there have been some extensive periods of bypass as a result of a lack of ICU capacity. With the increased bypass and with the designation of trauma centers in Alameda County, procedures have been adopted to enable MTV's to be transported to Highland or Eden Hospitals when John Muir is on bypass. These procedures are being monitored closely by both Counties.



### III. TRAUMA SYSTEM AUDIT AND EVALUATION

Trauma system audit and evaluation is carried out by the County Emergency Medical Services (EMS) Agency with the assistance of the Trauma Audit Committee and independent reviewers. On the EMS staff, a full time nurse trauma coordinator and a quarter time physician consultant are assigned to provide ongoing monitoring of the trauma system. During this first year particularly, all EMS staff have in fact been heavily involved in the trauma system.

Prior to designation of the trauma center, a team of trauma experts from outside the Bay Area was used to conduct a review of John Muir's proposal and facility. Members of that team and other trauma experts have been used to conduct subsequent reviews in January and in May 1987. Additionally, one of the team members, Ms. Gail Cooper, was asked to conduct an evaluation of the trauma system as a whole in May 1987. (Ms. Cooper's report is attached.) These reviews by independent trauma experts have been extremely useful both in identifying problems and in validating the program.

The key part of the trauma audit process is the County's Trauma Audit Committee (TAC) and its companion committee Pre-TAC. TAC is chaired by the County Health Officer, who is the designated EMS Medical Director, and is comprised of medical and nursing staff from County EMS, the Coroner's officer, the trauma center, and the medical community. Medical specialities include trauma surgery, neurosurgery, anesthesiology, emergency medicine, and pathology. TAC is a confidential medical audit committee which meets monthly to evaluate the care provided patients with major traumatic injuries. Cases reviewed include all trauma deaths, significant complications, and cases with teaching merit. All trauma deaths are rated by TAC as nonpreventable,



potentially preventable, or preventable.

Since March 1987 Contra Costa's TAC has been merged with Alameda County's to form a Bi-County TAC, which includes trauma surgeon representation from John Muir, Highland, Eden, and Children's Hospitals, neurosurgeon representation from both counties, the Coroner's pathologist from both counties, and County personnel. Actually, Alameda County neuro- and trauma surgeons, have participated as members of the Contra Costa TAC from the start in anticipation of the formation of a By-County TAC upon implementation of Alameda's trauma system.

All trauma cases are initially screened by a Pre-TAC committee which includes a subset of TAC members and additional representatives from local hospitals. This committee, which is separate for each county, determines which cases should be reviewed by TAC and also reviews system issues. Pre-TAC also meets monthly.



#### IV. BAY AREA TRAUMA REGISTRY

An important source of data on the care provided trauma patients is the Bay Area Trauma Registry sponsored by Contra Costa County and funded by the State Emergency Medical Services Authority from Federal Preventative Health and Health Services Block Grant funds. This project, which was undertaken in June 1986, with participation of Alameda, Napa, San Francisco, and Santa Clara Counties, has during its first year developed trauma patient data collection instruments, a data collection manual, data entry software, and a reporting system for use by the counties in their respective trauma audit processes. Trauma registry staff have implemented the registry in seven trauma centers and, in the process have provided invaluable assistance to the staffs of participating counties and trauma centers.

The project is funded at \$120,000 through June 1987. A proposal for second year funding has been submitted to the State and is pending approval at this time. During the second year, the project will focus on developing reporting formats and query procedures to facilitate use of the data base, data quality management, and on extending to Registry to additional Bay area trauma centers.

In addition to assistance to participating counties in conducting their ongoing trauma audit processes, the Bay Area Trauma Registry will provide a wealth of data for use in the study of trauma care and the refinement of prehospital triage techniques. Both the data and the products developed by the Bay Area Registry Project will be available to further trauma care throughout the State.



## V. STATISTICS



TABLE 1. TRAUMA BASE CONTACTS BY MONTH AND FIELD TRIAGE DECISION, July 1986 - February 1987.

Month	Trauma Base Contacts		Triaged as Non-MTV's		Triaged as MTV's					
					Total		Transport to Trauma Center		Transport to Closest ED	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1986										
July	238	100.0	137	57.6	101	42.4	93	39.1	8	3.4
August	222	100.0	147	66.2	75	33.8	68	30.6	7	3.2
September	194	100.0	108	55.7	86	44.3	82	42.3	4	2.1
October	217	100.0	108	49.8	109	50.2	103	47.5	6	2.8
November	190	100.0	108	56.8	82	43.2	74	38.9	8	4.2
December	173	100.0	86	49.7	87	50.3	77	44.5	10	5.8
1987										
January	153	100.0	67	43.8	86	56.2	80	52.3	6	3.9
February	149	100.0	74	49.7	75	50.3	70	47.0	5	3.4
Total	1536	100.0	835	54.4	701	45.6	647	42.1	54	3.5
Monthly average	192	100.0	104	54.4	88	45.6	81	42.1	7	3.5

TABLE 2. TRAUMA BASE CONTACTS BY BASE HOSPITAL AND TRAUMA CENTER DESTINATION, July 1986 - February 1987

Destination	All Bases		John Muir Base		Los Medanos Base		Mt. Diablo Base	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
John Muir Trauma Center	647	42.1	309	45.0	206	38.4	132	42.2
Children's Hospital	3	0.2	2	0.3	0	0.0	1	0.3
Other Emergency Dept.	886	57.7	376	54.7	330	61.6	180	57.5
Total	1536	100.0	687	100.0	536	100.0	313	100.0

NOTE 1: Includes patients transported by helicopter, out-of-county ambulance, or private transportation.  
 NOTE 2: Some breakdowns may have been estimated based upon data for recent months only.



TABLE 3. TRAUMA BASE CONTACTS BY FIELD TRIAGE AND INJURY SEVERITY, July 1986 - February 1987.

Injury Severity	Trauma Base Contacts		Triaged as Non-MTV's		Total		Triaged as MTV's		Transport to Trauma Center		Transport to Closest ED	
	=====		=====		=====		=====		=====		=====	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
Severely injured, total	435	28.3	34	4.1	401	57.0	347	53.4	54	100.0		
Trauma death												
Died in ED	48	3.1	0	0.0	48	6.8	4	0.6	44	81.5		
Died after admission	32	2.1	0	0.0	32	4.5	27	4.2	5	9.3		
Other severely injured												
ISS over 15	191	12.4	23	2.8	168	23.9	163	25.1	5	9.3		
ISS 10-14 with 3+ days	164	14.9	11	1.4	153	21.7	153	23.5	0	0.0		
Non-severely injured	1101	71.7	798	95.9	303	43.0	303	46.6	0	0.0		
Total	1536	100.0	832	100.0	704	100.0	650	100.0	54	100.0		

TABLE 4. UNDERTRIAGE AND OVERTRIAGE RATES, July 1986 - February 1987.

UNDERTRIAGE		
Number of patients triaged in field as MTV's		701
Number of patients inappropriately triaged in field as non-MTV's		34
Undertriage rate		4.9
OVERTRIAGE		
Number of patients triaged in field as MTV's		701
Number of patients inappropriately triaged in field as MTV's		303
Overtriage rate		43.2

NOTE 1: Includes patients transported by helicopter, out-of-county ambulance, or private transportation.

NOTE 2: Some breakdowns may have been estimated based upon data for recent months only.

SOURCE: Contra Costa County Emergency Medical Services, April 28, 1987.



TABLE 5. MAJOR TRAUMA VICTIMS (MTV'S) TREATED AT JOHN MUIR TRAUMA CENTER,  
July 1986 - February 1987 Discharges.

	Number =====	Percent =====
TYPE OF INJURY		
Blunt	496	82.8
Penetrating	103	17.2
Total	599	100.0
TYPE OF TRANSPORT		
Transports from field	584	97.5
By ground ambulance	512	85.5
By helicopter	57	9.5
Other	7	1.1
Unknown	9	1.5
Interfacility transfers	15	2.5
Total	599	100.0
AREA OF COUNTY		
West County	137	22.9
Central County	275	45.9
East County	154	25.7
Unknown	29	4.8
Out of County	4	0.7
Total	599	100.0
DISPOSITION FROM ED		
Admitted	550	91.8
OR	185	30.9
CCU postop	137	22.9
CCU direct	78	13.0
Ward	287	47.9
Died in ED	2	0.3
Transferred to acute facility	13	2.2
Discharged home	34	5.7
Total	599	100.0

(continued next page)



TABLE 5. MAJOR TRAUMA VICTIMS (MTV'S) TREATED AT JOHN MUIR TRAUMA CENTER,  
 July 1986 - February 1987 Discharges.  
 (Continued)

	Number =====	Percent =====
FINAL DISPOSITION OF ADMITTED PATIENTS		
Died	24	4.4
Transferred to acute facility	108	19.6
Transferred to other facility	18	3.3
Discharged home	400	72.7
Total admitted	550	100.0

NOTE: Some breakdowns may have been estimated based upon data for recent months only.  
 SOURCE: Contra Costa County Emergency Medical Services, April 28, 1987.



TABLE 6. MAJOR TRAUMA VICTIMS (MTV's) TRIAGED TO NONTRAUMA CENTER HOSPITALS,  
July 1986 - February 1987.

	Number =====	Percent =====
REASON FOR TRANSPORT TO NONTRAUMA CENTER		
CPR/unmanageable airway	54	100.0
TC on bypass	0	0.0
Total	54	100.0
RECEIVING HOSPITAL		
West County hospitals:		
Doctors	22	41.5
Herrick (Ala. Co.)	3	5.7
Brookside	1	1.9
Kaiser-Richmond	2	3.8
Central County hospitals		
Mt. Diablo	10	18.9
Merrithew	1	1.9
Kaiser-Martinez	0	0.0
Kaiser-Walnut Creek	5	9.4
Alta Bates (Ala. Co.)	0	0.0
East County hospitals		
Los Medanos	5	9.4
Delta Memorial	3	5.7
San Joaquin (S.J. Co.)	1	1.9
Total	53	100.0
OUTCOME		
Died in ED	44	81.5
Died after admission	5	9.3
Transferred to acute facility	1	1.9
Discharged	4	7.4
Total	54	100.0

NOTE: Some breakdowns may have been estimated based upon data for recent months only.  
SOURCE: Contra Costa County Emergency Medical Services, April 28, 1987.



TABLE 7. TRAUMA BASE CONTACTS TRIAGED AS NON-MAJOR TRAUMA VICTIMS (NON-MTV'S),  
July 1986 - February 1987.

AREA OF COUNTY	Number =====	Percent =====
West County	317	37.9
Central County	226	27.1
East County	292	35.0
Total	835	100.0
OUTCOME		
Not admitted	719	86.1
Died in ED	0	0.0
Transferred	44	5.3
Discharged	675	80.8
Admitted	116	13.9
Died	1	0.1
Discharged or transferred	115	13.8
Total	835	100.0
HOSPITAL OF ADMISSION		
West County hospitals		
Doctors	20	17.2
Brookside	3	2.6
Kaiser-Richmond	2	1.7
Central County hospitals		
Mt. Diablo	16	13.8
Merrithew	18	15.5
VA	0	0.0
Kaiser-Martinez	16	13.8
Kaiser-Walnut Creek	7	6.0
East County hospitals		
Los Medanos	5	4.3
Delta Memorial	17	14.7
Out of County hospitals	12	10.3
Total	116	100.0

NOTE: Some breakdowns may have been estimated based upon data for recent months only.  
SOURCE: Contra Costa County Emergency Medical Services, April 28, 1987.



# TRAUMA TRIAGE CRITERIA

PATIENT NAME: \_\_\_\_\_  
 DATE: \_\_\_\_\_  
 FIELD PERSONNEL: \_\_\_\_\_  
 TRANSPORTED BY(UNIT): \_\_\_\_\_

TIMES:  
 CALL RECEIVED: \_\_\_\_\_  
 AT THE SCENE: \_\_\_\_\_  
 EXTRICATED: \_\_\_\_\_  
 ENROUTE TO HOSPITAL: \_\_\_\_\_  
 ENROUTE TO REHDEZVOUS: \_\_\_\_\_  
 AT THE HOSPITAL: \_\_\_\_\_

SCENE TIME GREATER  
 THAN 20 min (REASON)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## MECHANISMS:

1. ☐ Evidence of high energy dissipation or rapid deceleration. Evidence may include vehicle roll-over, major damage to the vehicle, or impact    40 mph or greater.
2. ☐ Adult pedestrian hit by a vehicle traveling faster than 15 mph.
3. ☐ Child less than 12 yrs, hit by a vehicle.
4. ☐ Any patient ejected from a vehicle. Includes persons forcefully thrown from a bike, horse, skateboard or motorcycle.
5. ☐ Fall greater than 15 feet.
6. ☐ Intrusion of motor vehicle into passenger space by 1 foot or greater.
7. ☐ Surviving victims of fatal MVA, that is in the same passenger compartment with a person who was killed.
8. ☐ Persons requiring disentanglement from a vehicle. Estimated time for extrication           .

## ANATOMIC FACTORS:

9. ☐ Penetrating injury to the Head.
10. ☐ Penetrating injury to the Neck.
11. ☐ Penetrating injury to the Chest.
12. ☐ Penetrating injury to the Abdomen.
13. ☐ Penetrating injury to the Pelvis
14. ☐ Penetrating injury to the Groin
15. ☐ Significant BLUNT injury to the Head
16. ☐ Significant BLUNT injury to the Neck.
17. ☐ Significant BLUNT injury to the Chest.
18. ☐ Significant BLUNT injury to the Abdomen.
19. ☐ Significant BLUNT injury to the Pelvis.
20. ☐ 2 or more long bone fractures: (Humerus, femur - any combination)
21. ☐ Traumatic paralysis.
22. ☐ Amputation above wrist or ankle.
23. ☐ Major burns in association with trauma.

## PHYSIOLOGIC MEASURE

24. ☐ CRAIS SCORE of 7 or lower

CRAIS: Circle a number in each category.

## Circulation

- 2 Normal capillary refill and BP 100  
 1 Delayed capillary refill or systolic BP 85-100.  
 0 No capillary refill or systolic BP 85

## Respirations

- 2 Normal  
 1 Abnormal  
 0 Absent

## Abdomen

- 2 Abdomen and thorax nontender  
 1 Abdomen or thorax tender  
 0 Abdomen rigid or flail chest or penetrating wounds to the abdomen or thorax

## Motor

- 2 Normal  
 1 Responds only to pain or decorticate posturing is present (flexion)  
 0 No response or decerebrate is present (extension)

## Speech

- 2 Normal  
 1 Confused  
 0 No intelligible words

☐ TOTAL CRAIS SCORE (add the five numbers circled)

☐ Unable to obtain CRAIS:  
 Reason: \_\_\_\_\_

GLASGOW GOMA SCALE		
EYE OPENING	SPONTANEOUS	4
	TO VOICE	3
	TO PAIN	2
	NONE	1
VERBAL RESPONSE	ORIENTED	5
	CONFUSED	4
	INAPPROPRIATE WORDS	3
	INCOMPREHENSIBLE WORDS	2
	NONE	1
MOTOR RESPONSE	OBEYS COMMAND	6
	LOCALIZES PAIN	5
	WITHDRAW (PAIN)	4
	FLEXION (PAIN)	3
	EXTENSION (PAIN)	2
	NONE	1
GCS TOTAL		_____

RECEIVING HOSPITAL \_\_\_\_\_

BASE HOSPITAL \_\_\_\_\_ (contact made  
 prior to transport?) yes \_\_\_\_\_ no \_\_\_\_\_

Trauma Center on by-pass yes \_\_\_\_\_ no \_\_\_\_\_



CONTRA COSTA COUNTY

TRAUMA SYSTEM REVIEW

Submitted by:

Gail Cooper  
Consultant  
April 30, 1987



In reviewing a trauma system, one must evaluate the system's ability to get the "right patient" (triage) to the "right place" (trauma center) in the "right time" (golden hour). Ultimately, the system must answer the question, "Did the trauma system make a difference to the patients it served?"

The above criteria was applied in assessing the trauma system, including a review of the following documents:

1. Contra Costa County (CCC) Trauma System Plan
2. CCC Policies, Procedures and Protocols for the Trauma System
3. CCC Draft Trauma Report, July 1986 - February 1987
4. Trauma Quality Assurance Notebook
5. Trauma Issues Paper, dated April 23, 1987
6. Previous On-Site Evaluations, dated April 1, 1986 and January 29, 1987
7. John Muir Response to Previously Cited Deficiencies, January 28, 1987

In addition to reviewing the above documents, on April 24, 1987, I met with Art Lathrop, Director, Contra Costa County EMS Agency and staff, including the EMS Medical Director(s).

The purpose of the meeting was to review, in-depth, the Trauma System, its accomplishments to date, issues remaining to be solved, and to afford an opportunity for the EMS Agency staff to present an overview of the Trauma System in Contra Costa County, with specific emphasis on the system issues of triage, transportation, quality assurance and patient outcome.

According to the documents available for review during the period of July 1986 through February 1987, CCC Trauma System identified 1,536 patients who met call-in criteria for field triage assessment. Of this group, 23 percent (N = 699) were ultimately triaged as major trauma victims (MTV's) having met either the triage scoring parameter of CRAMS  $\leq$  7, or the anatomic/mechanism of injury consideration. During this same time period, 598 patients were admitted to the trauma center (average, 75 per month); July 1986 with the highest number of admissions (94) and February 1987 with the lowest number of admissions (62). Nearly half (46 percent, N = 275) of the major trauma incidents occurred in the Central/South Region of CCC, with 83 percent (N = 496) of the MTV's sustaining blunt injuries and 17 percent (N = 103) experiencing penetrating injuries. The majority of the MTV's (87 percent, N = 512) were transported to the Trauma Center via ground ambulance. Ten percent (N = 57) of the MTV's triaged to the Trauma Center arrived via the helicopter transport system. As reported by EMS Staff, the average on-scene time for ground ambulance personnel is 16 minutes and any on-scene time in excess of 20 minutes is



fully audited. The average ground transport time is under 20 minutes in the Central/South Region of the County, < 30 minutes from West County and < 30 minutes from East County. The total call time, as assessed from the time the call is received (unit underway in West County) until the time the patient is at the hospital, ranges from 35/45 minutes in East County to an average of 50 minutes in West County. This is well within the "golden hour" necessary for MTV's to reach definitive care within a designated trauma center.

MTV's admitted to the Trauma Center required surgery in 31 percent (N = 185) of the cases and 57 percent (N = 344) had significant risk of major morbidity or mortality as defined by an ISS of  $\geq 10$ .

The data available from the draft Trauma System Report suggests an under-triage rate of 4.9 percent (N = 34), which is far below the national average of 10-12 percent and exceeds the ideal of < 5 percent undertriage that most trauma systems try to achieve. This would tend to indicate that the triage tool, as well as the individuals responsible for screening potential MTV's, are being successful in identifying MTV's and ensuring their transport to the Trauma Center. No attempt is made to assess overtriage in this report, as more data would be necessary in order to fully evaluate that parameter.

The analysis provided above supports the conclusion that the CCC Trauma System is able to get the right patient to the right place, in the right amount of time.

In Contra Costa County, regional trauma care is monitored and audited by the County's Trauma Audit Committee. The Committee, consisting of physician and nurse trauma specialists, and County staff, meets on a monthly basis to review trauma patient care at the Trauma Center and satellite receiving centers. During the first eight months of review, the Trauma Audit Committee audited 461 major trauma cases, of which 78 (16.9%) were deaths. Each case was reviewed and a determination was made regarding any questionable care or patient outcome. The following table depicts systemwide trauma morbidity and mortality during the review period.

TABLE I  
MORBIDITY AND MORTALITY

Trauma System	Not Preventable	Preventable	Potentially Preventable
Mortality	78	2 (2.6%)	4 (5.1%)
Trauma System	Total Error/Complication	Error in Management	Complication
Morbidity	17 (3.7%)	10	7



Previously, Dr. Trunkey, et al, published a report assessing patient outcome in 39 trauma related deaths occurring in hospitals within Contra Costa County. The evaluation done during this study indicated that 5 (12.8%) of the deaths were preventable and 12 (30.8%) were potentially preventable.

The following table demonstrates the differences in traumatic mortality, by comparing the data from the Trunkey Study and the data from the Trauma Audit Committee audit. The methodology for determining preventable or potentially preventable deaths may not have been the same for the two populations reviewed. Therefore, this comparison should be viewed as a "general" comparison rather than scientifically valid.

**TABLE II**  
**MORTALITY REDUCTION**

	TRUNKEY STUDY	TRAUMA AUDIT COMMITTEE REVIEW	PERCENT REDUCTION
Trauma Deaths Evaluated	39	78	
Preventable Deaths	5 (12.8%)	2 (2.6%)	80%
Potentially Preventable	12 (30.8%)	4 (5.1%)	83%

From a review of this data, it appears that the Trauma System in Contra Costa County has made a significant reduction in preventable trauma deaths during its first eight months of system operation.



The Trauma Policy adopted by the Board of Supervisors established specific goals and objectives for the Trauma System. During this review, an assessment was made to determine if the EMS Agency had met the stated goals and objectives.

TABLE III

<u>GOAL</u>	<u>ASSESSMENT</u>
Improve EMS Communication System	In progress. Priority is given to trauma calls. However, there are still only two frequencies available for paramedic communication and base hospital medical control. The communication system for EMS in Contra Costa County is still substandard; however, there are plans for the paramedics to use cellular phones within the next year, which should improve the pre-hospital communication network.
Standardize Dispatch Procedures for Prehospital	In progress. The EMS Agency has developed a dispatch priority system and training curricula. However, to date, the dispatch agencies have been reluctant to implement the program. One agency has begun a call screening program and the EMS Agency anticipates others to follow once this system has been tried and tested.
Improve Care to Trauma Victims in Contra Costa County	Goal met; ongoing. A number of different parameters attest that the care to the trauma patient has improved. <ol style="list-style-type: none"><li>1. Major trauma outcome improved.</li><li>2. Reduced scene times.</li><li>3. Prehospital trauma training.</li></ol> Although these factors cannot all be measured statistically, it was the feeling of the staff, in participating in the Trauma Audit Committee review each month, that trauma patient care had significantly improved over the last eight months.



Fewer Deaths from  
Trauma Injury

Not evaluated.

Although this parameter was not evaluated, the previous review of the reduction in preventable deaths would indicate that this goal may, in fact, have been met. Further, the probability of survival data provided indicated that the system could predict 413 survivors of major trauma. Yet, for the months reviewed, there were 422 survivors, 9 more than predicted.

OBJECTIVE

ASSESSMENT

Establish Trauma  
System Standards

Task completed.

Establish Mechanism  
to ensure continuing  
compliance with  
Trauma Standards

Task completed; ongoing evaluation.  
Audit done by Trauma Audit Committee.

Integrate Trauma  
Care with Existing  
EMS System

Not validated.  
The EMS Agency does not routinely  
analyze prehospital data to be able  
to assess this parameter.

Definitive Trauma  
Care regardless of  
ability to pay

Not evaluated.

Trauma Service  
coordinated with  
other Counties

In progress.  
Communication ongoing with Alameda and  
Solano Counties regarding trauma  
service interface between counties.

Accountability and  
Objective Evaluation  
of Trauma System

Task completed; ongoing.  
The Trauma Audit Committee meets on a  
monthly basis to review all trauma  
medical care.

Public Awareness

Task completed; ongoing.

In addition to establishing goals and objectives for the Trauma System, the Trauma Plan set out an ambitious action plan to be implemented within the first year. For the most part, these action items have been thoroughly implemented by the staff of the EMS Agency working with the EMCC, Base Hospitals, prehospital providers and the Trauma Center. During the first year, extensive trauma training was provided to all system participants. This training included an orientation to the Trauma Plan, trauma triage and trauma patient management. Public education was also initiated by the Agency, EMCC and Trauma Center. Public awareness included



establishment of a speakers bureau and media coverage, and the development of a brochure is in process. Extensive research and development resulted in a comprehensive Trauma Registry being implemented. In addition to the Trauma Registry as the primary source of data collection, a Base Hospital Trauma Monthly Report was also developed and implemented. This data is reviewed monthly and used to identify trends and make system adjustments as necessary. The extensive information on the Trauma Registry will allow the Agency to fully assess trauma care in Contra Costa County, including the financial impact the trauma system has had on the hospitals and patients.

Areas still needing attention, as identified in the Plan, include:

- Law Enforcement Trauma Orientation
- Integration of Trauma Plan into OES Operations
- Receiving Hospitals Participating in Data Collection System
- Receiving Hospitals Transfer of MTV's to the Trauma Center

### Issues Identified/Recommendations:

There are two major issues/concerns that have been identified during this review. The first is the failure of receiving facilities to transfer MTV's to the Trauma Center. I understand that this problem is compounded by personnel at State Licensing refusing to allow facilities that are licensed acute care institutions to transfer potential MTV's. This issue raises major liability concerns, particularly for facilities that must keep MTV's when they are not appropriately equipped and staffed to administer to the needs of the patient. I would recommend that either the Director of Health for Contra Costa County or County Counsel direct a letter to the State Director of Health, addressing this issue. The standard of care in your community has now clearly been established as that care given by a designated trauma center participating in a designated trauma system. To openly deny patient access to that level of care seems to me to fly in the face of the reason trauma centers are created and creates considerable system risk.

The second issue has to do with prehospital data collection. It is essential in evaluating trauma care and the Trauma System to be able to include in the evaluation an assessment of the care rendered in the prehospital setting. The EMS System should be able to assess what impact, if any, did the EMT's and Paramedics have on patient outcome. Further, it is essential that the prehospital patient record be left at the hospital with the patient. This document is a legal medical record and, as such, must be included as part of the patient's medical chart. I would recommend that a system be developed that ensures:

1. The hospital receiving the patient receives a readable (should be original for legal purposes) patient record form for each patient.
2. The EMS Agency has the ability to monitor and audit prehospital patient care.
3. The Medical Director has the ability to analyze prehospital care given, treatments rendered, response time, etc., by medic, by unit, by agency.



### Overall Assessment:

Contra Costa County has developed and implemented an outstanding Trauma System. The staff of the EMS Agency have developed policies and procedures for effective system operation, met the goals, objectives and action plan defined in the Trauma Plan and established a system for effective monitoring and auditing of the Trauma System. Each member of the EMS Agency and the participants of the EMS System can be proud of the accomplishments during this first year of system operation.

During the second year of operation, the following are suggestions for further system improvements:

1. Computerize the Base Hospital Monthly Reports and Trauma Audit Committee findings in order to better track system trending and provide a statistical analysis of the data collected.
2. Computerize the prehospital patient information discussed previously.
3. Breakdown ground transport information by ALS and BLS.
4. Breakdown major trauma surgery by < 1 hour, < 24 hours > 24 hours.
5. Continue working on EMS communication system.
6. Carefully monitor and audit impact of new procedure regarding transport of pediatric MTV's.
7. Ensure that, for all transport agencies, a system is in place that allows for two attendants in the back of the ambulance while transporting critically injured patients to the Trauma Center.
8. Continue prehospital trauma training with emphasis on new personnel. (This task should be the responsibility of the base hospitals.)

In summary, this reviewer concludes that the Contra Costa County Trauma System is effective in identifying MTV's and ensuring their prompt transfer to the Trauma Center. Further, it has established a mechanism of quality assurance that enables the agency to identify deviations in standard of care and, if necessary, to take corrective action. You are to be commended for a job well done.

GFC:blj  
G60:9-10-11

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